Mr. Newall took an active part in superintending the actual laying of many cables, and on these occasions he showed the qualities of a leader of men—cool in an emergency, confident in his own resources, and undismayed in disaster. "Gentlemen, it's over now; ye may go to bed," was his only remark when a cable broke involving a loss of many thousands of pounds.

During the Crimean War he laid a wire insulated in gutta-percha without sheathing of any kind from Varna to the Crimea. It was run out over the stern through hand leathers held by the cable men in turn. He formed one of the boat's crew that left to seek help for the passengers of the P. and O. steamship *Alma*, wrecked in 1859 in the Red Sea.

But, during this busy life, Mr. Newall never allowed his love of pure science to be crushed by the weight of the practical affairs in which he was engaged. The success of submarine telegraphy was due to no one individual only, but to Mr. Newall belongs the credit of inaugurating a new era in the construction of refracting telescopes. He had long wished to possess a refractor of large dimensions, and in the Exhibition of 1862 he discovered two large disks of crown and flint glass, manufactured by Mr. Chance, of Birmingham. He at once saw that his opportunity was come, secured the glass, and placed it in the hands of Mr. Cooke, of York.

As the result of his boldness in risking a very large sum on an experiment the success of which was most uncertain, Mr. Newall carried, at one bound, the diameter of the largest object-glass from 15 to 25 inches. His observatory was a spot to which the most distinguished astronomers journeyed, and to which Profs. Newcomb, Holden, and Alvan Clark came as a deputation from the other side of the Atlantic.

Mr. Newall's original idea was to mount the telescope in the Mauritius, and spend as much time as possible there himself. This plan has never been carried out, and the great Newall refractor has never yet had a fair chance under the adverse skies of Newcastle. Almost his last act was to offer it as a gift to the University of Cambridge, and it is to be hoped that it may there add to the high scientific reputation that University has won.

To have established a new industry, to have taken an active part in securing a triumph of applied science which will modify the history of the world, and to have led the way in the development of the refracting telescope, is a record of achievement to which few attain, but which does bare justice to the life-work of Robert Stirling Newall.

NOTES.

THE Report of the Royal Commission appointed to consider the expediency of establishing a Teaching University for London, has been laid on the table of the House of Commons, and the Blue-book may be expected in the course of the next week. The Commissioners are agreed—first, that the petition of the Royal Colleges of Physicians and Surgeons to be authorized to grant degrees in medicine should not be entertained; secondly, that it is desirable that London should have a Teaching University. On the third point—whether a charter shall be granted to the associated Colleges of King's and University, constituting these Colleges the Teaching University of London—the Commission are divided. The three Commissioners connected with the teaching profession (Sir William Thomson, Prof. Stokes, and Mr. Welldon), are in favour of it; the three lawyers (Lord Selborne, Sir James Hannen, and Dr. Ball), are opposed to it. The Report ends with a request that this question be referred back to the Commission for their further consideration, in order that they may determine whether it is not possible to devise a scheme of common action between the two Colleges and the existing University of London.

PROF. STOKES will deliver the Rede Lecture on Wednesday, June 12, at 2 p.m., in the Senate House, Cambridge, the subject being, "Some Effects of the Action of Light on Ponderable Matter."

THE Museums and Lecture Rooms Syndicate, Cambridge, have been authorized to have quantities taken out and tenders invited for the proposed Anatomical and Physiological Buildings, in three distinct blocks.

MRS. DE LA RUE has presented to the Royal Institution the philosophical apparatus of the late Dr. Warren de la Rue. A fine portrait of Sir Humphry Davy has been presented to the same Institution by Mr. James Young, grandson of the late Dr. James Young, F.R.S., of Kelly, the former owner of the portrait.

THE Swedish Government has decided to send a man-of-war to New York to bring home the body of Captain Ericsson, who expressed a strong desire to be buried at Långbanshyttan, in Vermeland, the place of his birth. In his will no directions are given as to the disposal of his valuable collection of models, but Swedish journals state that the executors will present them to the Smithsonian Institution.

THE last mail from Bombay brings news of the formal opening, by Lord Reay, of the Jubilee Technical Institute in that city. The *Times of India*, commenting on this event, says it forms a notable landmark in the educational history of Bombay. That the Institute meets a public want is shown by the circumstance that it already numbers two hundred and forty students, while nearly half as many are awaiting nomination. The origin of the Institute is this. When Lord Ripon was about to leave India, a movement was set on foot to signalize his Viceroyalty by a memorial of some kind, and subscriptions were collected for the purpose. Soon after Lord Reay's arrival in Bombay there arose suggestions for the formation of a technical school. The Government in January 1887 promised a grant of 25,000 rupees annually, and recommended to the Municipal Corporation of Bombay that 80,000 rupees which they proposed to devote to commemorating the Jubilee of the Queen's reign should be devoted to the founding of a technical institute. The other funds were amalgamated with this, and a Board of management was formed; but still the funds were found insufficient, until at last the munificence of Sir Dinshaw Petit came to the rescue. He presented the Board with a noble building, and work began at once, and the formal official opening took place recently, although, in fact, the Institute has been open for several months. The immediate and signal success of the Institute Lord Reay attributes in no small measure to the fact that in starting the movement its originators did not allow themselves to yield to the demand for a programme.

THE Upsala University and the Swedish Geographical Society have sent Dr. Carl Forsstrand to study the marine fauna of the West Indian Islands during the present summer.

THE Indian papers report the death from cholera, at Rangoon, of Dr. Robert Romanes, Professor of Science in the Rangoon College, and Chemical Examiner to the Burmah Government.

IN the horticultural part of the Paris Exhibition there are some splendid beds of Darwin tulips in full bloom. The flowers are magnificent, and a *sergent de ville* keeps watch over them—an unusual proceeding in France, where flowers are never in ordinary circumstances stolen from public gardens. Unfortunately the presence of an unusual number of foreigners makes this precaution necessary. In the same part there is a very curious exhibit of Japanese horticulture. It consists of a number of specimens of dwarfed trees—trees which are usually tall, but in the present case hardly attain the height of 2 or 3 feet. This exhibit excites much interest among gardeners.

ZOOLOGISTS will be interested in the exhibit of the Principality of Monaco at the Paris Exhibition, as all the implements used by the Prince in his dredging experiments are to be shown, with numerous specimens of deep-sea fauna. The exhibit of the results of the *Talisman* researches will unfortunately be scanty.

LAST week, Mr. Ralph Moore, Inspector of Mines for the Eastern District of Scotland, on his retirement from that post, which he has held for twenty-seven years, received a farewell present from a number of gentlemen connected with the Scottish coal and iron trades. In thanking the donors, Mr. Moore gave some interesting details of the improvement in mining appliances since he first was a colliery manager, forty-eight years ago. At that date, he said, there were cages at two or three collieries in the county of Edinburgh, but there was none in Lanarkshire. The coals were all drawn in corbes. A few years after, there was not a single colliery without them. Pug engines were first introduced about 1845. Ventilating furnaces were of the most primitive description. Fans were unknown. The first fan in Scotland was put up in 1868; now there were hundreds, and scarcely anyone thought of doing without a fan. The amount of ventilation in a colliery was from 8000 or 10,000 down to as low as 1000 cubic feet per minute, and now there were some collieries in the district with 250,000 cubic feet per minute. Last year he made the calculation that eight tons of air were sent into the mines for every ton of coals extracted. Wire ropes were not in use at the time of which he spoke; now there was nothing else. Underground mechanical haulage was practically unknown; now it was universal. Many large collieries had only one shaft, now all had two. A coal-owner putting out 100,000 tons a year was a large coal-owner. There were coal-owners now putting out over 600,000 annually. As a consequence of all these improvements, the output of minerals in the district, which in 1856 was 4,500,000 tons, was now 17,000,000 tons, and the death-rate, which in 1853 was one for every 250 persons employed, is now about one in 800.

IN connection with the Congress of German Anthropological Societies, which is to meet this year at Vienna, a large exhibition of prehistoric objects is being formed. All the smaller public collections and the most important private ones of Austria will be represented.

SIR W. BRANDFORD GRIFFITH, Governor of the Gold Coast, has reported to Lord Knutsford the occurrence of a smart shock of earthquake at Accra on April 5, at 12.2 noon. The seismic wave seemed to run from south to north, and was felt at Aburi, twenty-six miles to the northward of Accra. Sir W. B. Griffith had not heard of any serious damage being caused in the colony, nor, so far as he could hear, was the earthquake felt at sea or at Addah. Christiansborg Castle, the Government House at Accra, was once laid in ruins by an earthquake.

EARTHQUAKES still continue in the neighbourhood of Vyernyi in Turkestan. On February 19, at 3 p.m., an earth-tremor was felt after a fortnight of absolute rest. The shock was quite isolated, and lasted but a few seconds. Another slight shock was felt during the night, at 2 a.m. On February 25, at 11 a.m., a noise like that of a discharge of a battery of guns was heard, and the soil was set in motion for about three seconds. Many houses cracked, but there was no loss of life.

La Nature of April 27 contains a representation, by photolithography, of an interesting synoptic table of weather prediction, by MM. Plumandon and Colomès, whereby anyone may find mechanically the probable weather, by observing the direction of the wind, as based upon fourteen years' observations at the Puy-de-Dôme Observatory. The table from which the representation is reduced, is printed in six colours, and is divided into eight sectors corresponding to the principal directions of the wind, and comprising 216 weather conditions. A movable indicator, with three arms, works upon a pivot; one arm being moved to represent the wind direction as shown by the clouds or a good wind-vane, the others then point to the region of lowest barometer, and to the probable weather, indicated by one of the cases referred to. These conditions are contained in a few words, and differ for each season of the year, and for different states of the barometer, *e.g.* high, low, &c. The principle involved is merely an application of the rule known as Buys Ballot's law: "Stand with your back to the wind, and the barometer will be lower on your left hand than on your right," combined with the experience gained in weather prediction during the last thirty years. A card somewhat similar in principle was published some years ago by the late F. Pastorelli. Persons unable to consult daily weather charts may find the diagram very useful.

IN a private letter recently received from Dr. Macgregor, the Governor of British Guinea, an interesting account of his trip in the *Hygeia* through the Louisiade Archipelago and the adjacent groups of islands is given. He found them, he says, all thickly inhabited, the natives being in thousands, and in many cases very wild—so wild, in fact, that he thinks it probable they had never seen a white man before. On some of the islands he found hot mud-springs, some of them being strongly impregnated with sulphur. Gold was found on many of the islands, but in no instance was it in payable quantities.

ACCORDING to *Allen's Indian Mail*, the Madras Museum now possesses the skeleton of the largest elephant ever killed in India. This elephant was the source of great terror to the inhabitants of South Arcot, by whom it was killed and buried. The Museum authorities despatched a taxidermist to the spot to exhume the bones and transfer them to Madras. The skeleton is exactly 10 feet 6 inches in height, being 8 inches higher than the highest hitherto measured in the flesh by Mr. Sanderson.

MR. LESTER WARD has recently claimed an American origin for the entire genus Platanus, of which the plane and the sycamore are the best-known species. It occurs abundantly, however, in these isles, in the Lower Eocenes of Mull, Reading, and the Middle Eocene of Lough Neagh, the former being probably at least as old as the beds in which it makes its earliest appearance in America. It probably came into existence in the Old World in late Cretaceous times.

DR. MARION describes, in the *Annales des Sciences Géologiques*, a new conifer, having the foliage of Araucaria with the cones of Dammara, and therefore an essentially Australasian type, which only became extinct in France in the Miocene. The material is so perfect and ample that very little more would remain to be learnt about it, were it still living. The same, or a nearly allied, species abounded in the Isle of Wight in the Oligocene. In outward form the tree must have resembled Cryptomeria.

THE May number of the *Kew Bulletin* opens with an interesting account (with plate) of the Persian dye plant *Zalil*, prepared by Sir Joseph Hooker for the April number of the *Botanical Magazine*. This is followed by an account of Tasmanian woods, some curious details as to lily flowers and bulbs used as food, a paper on Pu-êrh tea, an account (with plate) of the short-podded yam-beam, and a list of the staffs of the Royal

Gardens, Kew, and of botanical departments and establishments at home, in India, and in the Colonies, in correspondence with Kew.

In his Report for 1888, just issued, the librarian of the Mitchell Library, Glasgow, notes, for the third year in succession, a decrease in the number of volumes issued to readers. This is believed to be mainly due to the fact that the rooms are not nearly large enough to provide accommodation for those who wish to use the library. Even now, notwithstanding the decrease of attendance, the rooms are often inconveniently crowded. It seems strange that in a wealthy and intelligent city like Glasgow there should be the slightest difficulty about the provision of a proper building for so good a collection of books—a collection which, according to the librarian, "is becoming year by year richer in all departments of literature, better fitted to supply the wants of every student and every reader."

The Burton-on-Trent Natural History and Archæological Society have begun to issue "Transactions"; and if we may judge from the first volume, which we have just received, succeeding volumes are likely to contain a good deal of interesting work. The most important paper in the present volume is a Report, by Mr. John Heron, on certain explorations carried on at Staplehill in 1881, under the auspices of the Society. In the course of these explorations the remains of upwards of thirty-six human bodies were found, accompanied in some cases by personal ornaments, small iron knives, or weapons of a kind which showed that the ground had been a burial-place of the English in pagan times. The various "finds" are clearly described by Mr. Heron, whose paper is admirably illustrated by a frontispiece and ten plates.

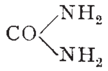
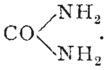
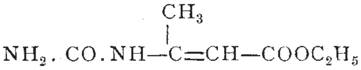
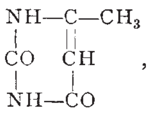
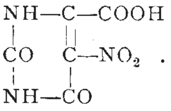
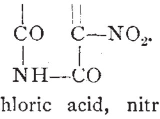
The third chapter of the revised edition of Dr. Elias Loomis's "Contributions to Meteorology" has been issued. In this chapter the author deals with the mean annual rainfall for different countries of the globe; describes the conditions favourable, and the conditions unfavourable, to rainfall; examines individual cases of rainfall in the United States, in Europe, and over the Atlantic Ocean; and defines the areas of low pressure without rain. Many valuable plates accompany the text.

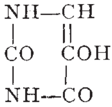
The May number of *Himmel und Erde* (Berlin) opens with an interesting description of the Lick Observatory, and an account of its foundation by the Director, Prof. Holden. The article is illustrated by a view of the giant refractor and the interior of the Observatory, the presence of three of the observers serving to give an idea of the immense size of the instrument. Dr. Mohn continues his account of the Norwegian North Sea Expedition, and Dr. Wagner concludes his article on the Krakatão eruption. Other articles and astronomical data for the month are also given.

The new number of the *Folk-lore Journal* (vol. vii. part 2) contains an interesting paper, by Mr. John Abercromby, on the beliefs and religious ceremonies of the Mordvins, a people of Finnish descent inhabiting parts of Central Russia, who were pagans up to the beginning of the present century. The paper gives their conception of the Deity, a list of the various objects of worship, their account of the creation and the fall of man, and descriptions of their feasts and sacrifices. The paper is one of considerable length. Mr. Edward Clodd follows up his recent paper on "The Philosophy of Punchkin" by a similar one called "The Philosophy of Rumpelstiltskin," the latter being a generic title derived from the character in Grimm's well-known *Märchen*. An interesting bibliography of variants of the tale is appended. Students of folk-lore anxious to aid the Society by practical work will be glad to have their attention attracted to the appeal of the Council for volunteers to tabulate certain works which are mentioned, the method of tabulation being shown at the end.

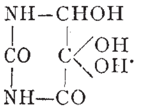
Messrs. Smith, Elder, and Co. have issued a new edition of "Wild Life in a Southern County," one of the finest of the late Mr. Richard Jefferies's writings.

At a recent meeting of the Linnean Society of New York City, Dr. G. B. Grinnell read an instructive paper upon the Rocky Mountain goat (*Mazama montana*). The limits of the range of this animal have never been fully defined by any one writer. It is a mammal belonging to the Arctic fauna, and only found among the high and rugged mountains of the Rockies and Coast Range, where the snow lies all the year. The centre of its abundance seems to be in Western Montana, Idaho and Washington Territories, and British Columbia, and it has been found from about latitude 44° to about latitude 65°; its southernmost records being on the highest peaks of the Sierra Nevada, near Mount Whitney. This goat is in no immediate danger of extermination, as it inhabits the most inaccessible localities, and has few natural enemies.

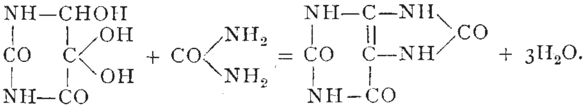
Uric acid has been synthesized by Drs. Behrend and Roosen, of Leipzig, in a manner which completely settles the question of its constitution. A few months ago a synthesis of this important natural compound was effected by Horbaczewski, by fusing together glycocine, $CH_2.NH_2.COOH$, and urea,  $CO\Big\langle\begin{matrix}NH_2\\NH_2\end{matrix}$. High temperature reactions, however, are never satisfactory as indicating the constitution of organic compounds, inasmuch as there is always a possibility of inter-molecular change. Hence a new mode of synthesis at lower temperatures has been devised by the Leipzig chemists, and carried out in an admirable manner, every stage being most critically investigated so as to be absolutely certain of the constitution of the intermediate compounds. The process consists of seven stages:—(1) The substances started with are aceto-acetic ether, $CH_3.CO.CH_2.COOC_2H_5$, and urea,  $CO\Big\langle\begin{matrix}NH_2\\NH_2\end{matrix}$. These two compounds combine together with elimination of water, forming an ether of crotonic acid in which one of the hydrogen atoms is replaced by the radical of urea,  $NH_2.CO.NH-\overset{\overset{\displaystyle CH_3}{|}}{C}=CH-COOC_2H_5$. (2) This substance on saponification with caustic potash yields the potassium salt of the corresponding acid. The free acid itself readily splits off water, forming the anhydride, , methyl uracil, as it is termed. (3) On treatment with fuming nitric acid, the CH_3 of methyl uracil becomes oxidized to the acid radical, COOH, a nitro-group, NO_2, being simultaneously introduced, . (4) On boiling this nitro-acid with water, a molecule of carbonic anhydride is eliminated, leaving a substance termed nitro-uracil, . (5) On reduction with zinc and hydrochloric acid, nitro-uracil yields iso-barbituric acid—a compound which has been shown in a previous paper of Dr. Behrend's to possess the constitution



(6) By oxidation of iso-barbituric acid with bromine water another acid is obtained, which is found to be isomeric with dialuric acid, but differs entirely from that acid in properties; it is therefore termed iso-dialuric acid. From its reactions it is shown to correspond to the constitution



It crystallizes in long rhombic prisms containing a molecule of water of crystallization, which it loses at 100° C. The yield is very good, 80 per cent. or more of the theoretical. (7) It now only remains to mix this iso-dialuric acid with one equivalent of urea and six equivalents of sulphuric acid, the latter to take up three molecules of water which are eliminated in the reaction between the two former substances. The reaction is complete in the cold in twenty-four hours, or in five minutes if the mixture is gently warmed upon a water-bath. On cooling and adding water, uric acid is precipitated in small crystals, which, on purification, exactly resemble those of natural uric acid. The equation is very readily understood, there being a simple combination of iso-dialuric acid and urea with formation of uric acid and elimination of three molecules of water—



Iso-dialuric acid. Urea. Uric acid.

Hence the formula of Medicus and Fischer for uric acid may now be considered as finally proved.

THE additions to the Zoological Society's Gardens during the past week include a Purple-faced Monkey (*Semnopithecus leucoprymnus*) from Ceylon, presented by Mr. J. H. Taylor; a Vervet Monkey (*Cercopithecus lalandii* ♂) from South Africa, presented by Dr. W. K. Sibley; an Otter (*Lutra vulgaris*) from Cornwall, presented by Mr. Basset; a Long-eared Owl (*Asio otus*), British, presented by the Hon. Eric Thesiger; a Herring Gull (*Larus argentatus*), British, presented by Mrs. Gainsford; a Yellow-billed Amazon (*Chrysotis panamensis*) from Panama, presented by Lord William Cecil; two Common Kestrels (*Tinnunculus alaudarius*), captured at sea, presented by Captain Janes; two Common Rheas (*Rhea americana*, juv.) from Uruguay, presented by Mr. J. D. Kennedy; a Black Swan (*Cygnus atratus* ♂) from Australia, presented by Mrs. Siemens; a Long-eared Owl (*Asio otus*), British, presented by the Rev. F. Hopkins; two Natterjack Toads (*Bufo calamita*), British, presented by Master H. Millward; two Natterjack Toads (*Bufo calamita*), British, presented by Master A. Smith; a Bonte-bok (*Alcelaphus pygargus* ♂) from South Africa, deposited; a Squacco Heron (*Ardea ralloides*) from South Europe, three Japanese Teal (*Querquedula formosa* ♂ ♀ ♀), from North-East Asia, an Amherst Pheasant (*Thaumalea amherstiæ* ♂), from Szechuen, China, purchased; two Moor Harriers (*Circus maurus*) from South Africa, received in exchange.

OUR ASTRONOMICAL COLUMN.

THE RESIDUALS OF MERCURY.—In a recent discussion of the perturbations of Mercury (*Astronomical Journal*, No. 191, April 15, 1889), Mr. O. T. Sherman has arrived at some important and highly suggestive results relating to the residuals. His method [of determining these appeared in No. 173 of the *Astronomical Journal*, and this process has been employed in obtaining the data given in the article referred to. The values arrived at show a remarkable relation to the heliocentric latitude of the planet, the maximum effect being nearer the solar equator, and the effect decreasing as the latitude increases. Since the lower latitudes correspond to maximum and the higher ones to minimum solar activity, the apparent connection of the disturbances of the planet with solar phenomena should also bear some relation to the sun-spot period, and Mr. Sherman gives figures to show that this is the case. The chief disturbances occur in the years when the sun-spots are increasing in frequency, and it is pointed out that this result is in strict accordance with the retardations of Encke's Comet during perihelion passage.

It is further stated that "the forces deflecting the planet are sunward when the planet is in that part of space towards which the sun is travelling, and away from the sun when the planet follows in his path." This, taken in conjunction with the disturbances of Encke's Comet, seems to Mr. Sherman "to indicate a considerable amount of matter coming to the sun from space. If so, its place of meeting with the matter coming from the sun should abound in collisions, and display local spectra showing bright lines. Our knowledge of the zodiacal light is fully in accord with such a supposition."

If the more detailed investigations of the residuals, which it is intended to make when more observations have been collected, confirm the results already obtained, we may look for a considerable advance of our knowledge, especially of the nature of the solar surroundings. Already the residuals clearly admit of explanation by supposing that the sun, with its meteoritic surroundings, in the form of the corona and the zodiacal light, is moving with considerable velocity through a meteoritic plenum. In that case the planet would encounter most meteorites when on the advancing side of the sun, and it would obviously be more retarded there than elsewhere.

The apparent relation to the sun-spot period is of great interest in connection with the meteoritic theory of the formation of sun-spots. According to this theory, there should be most meteorites in the solar surroundings at maximum spot period, and greater disturbances of the planet at that period would therefore be expected. The collisions between the two sets of meteorites would further produce the spectroscopic phenomena associated with the zodiacal light—namely, the appearance of a line near wave-length 558, which has been ascribed to manganese. It seems probable that the variability of this spectrum which has been suspected by Mr. Sherman (letter to Mr. Lockyer, quoted in Roy. Soc. Proc., vol. xlv. p. 248) may also subsequently be shown to be connected with the sun-spot period.

RIGHT ASCENSIONS OF NORTH CIRCUMPOLAR STARS.—Prof. T. H. Safford, Field Memorial Professor of Astronomy at Williams College, Mass., has just published a very useful piece of work in the shape of a Catalogue of North Polar Stars. This Catalogue, which is a first instalment of a more extensive one, the observations for which are now in progress, has been constructed by Prof. Safford in order to strengthen what he felt to be the weak point of all the standard Catalogues, viz. the right ascensions of Polar stars. It was also a consideration with him that it would be easier to take account of instrumental corrections if a more extended list of Polars were generally used than has been the custom. These stars are also of importance in the study of proper motions, since their early observations are accurate.

The observations for this Catalogue were made at the Field Memorial Observatory, and not at the Hopkins Observatory of Williams College, and the meridian circle with which they were made was a fine one of 4½ inches (French) aperture, by Repsold. The observations were made at first by eye and ear, but a fillet chronograph was used in 1887 and 1888. Prof. Safford's intention throughout was to make his Catalogue a differential one; the stars he has relied upon for his instrumental corrections, being those of Publication 14 of the Astronomische Gesellschaft, which lie within 10° of the Pole. Besides the catalogue itself, which contains 261 stars, of which just 200 are within 10° of the Pole, a very important part of the work is the discussion of the right ascensions, with a view to clearing up certain points as to mode of observation, as well as to find the weights and systematic corrections necessary for combining this series with others. The result of this discussion is to show that it tends to greater accuracy to base a catalogue of Polar R.A.'s on standard places in all hours of right ascension rather than on double transits alone; that the eye-and-ear method should be used as the stan-